MONTGOMERY COUNTY, MARYLAND

TEN-YEAR COMPREHENSIVE WATER SUPPLY AND SEWERAGE SYSTEMS PLAN

CHAPTER 2: GENERAL BACKGROUND

APPROVED 2003 - 2012 PLAN

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CHAPTER 2: GENERAL BACKGROUND

I. INTRODUCTION

Chapter 2 presents general background information about the county relevant to issues involving water supply, sewerage systems, rural sanitation planning, and water resources. The chapter presents this information in two general categories: the natural environment and the cultural environment. The various characteristics of the natural environment–geology, topography, soils and water resources–strongly affect water supply, sewerage, and rural sanitation needs, problems, and solutions in the county. A second group of relevant characteristics are classified as the cultural, or human-made, environment, which include patterns and density of existing and proposed residential, commercial, and institutional development; and the various legal requirements, policies, and plans that shape the cultural environment.

Much of the data presented in this chapter generalizes information about Montgomery County's 500-square-mile area. Many of the individual planning efforts described in subsequent chapters address much smaller areas and are supported by more site-specific data.

II. NATURAL ENVIRONMENT

This section addresses natural, physical features of the county which affect the feasibility, nature, location, design, and implementation of community and individual water and sewerage systems. For example, the basic topography of the county is a significant factor in determining the location and design of water storage facilities and trunk sewer lines. Soil and geologic characteristics are a major factor in determining the suitability of specific areas of the county for subsurface disposal of wastewater. Other data presented are similarly relevant to the Plan's subsequent chapters.

A. Topography -- The general topography of Montgomery County, illustrated in Figure 2-F1, is dominated by a rolling plain or "low hill" landscape. Hills are concentrated in the northern part of the county adjacent to the major stream valleys. The highest point in the county is 873 feet above sea level; the lowest point, 52 feet above sea level. The average elevation gradient is 29 feet per mile.

B. Climate -- Montgomery County's average winter temperature is 35 degrees Fahrenheit (F), with an average daily minimum of 25 degrees F. The summer average temperature is 74 degrees F, with an average daily maximum of 86 degrees F. Average total annual precipitation is approximately 40 inches. Of this, more than 22 inches (55 percent) usually falls during the period from April through September.

C. Geology -- The general position of the bedrock units across Montgomery County, and the strike of their foliation and cleavage, lies in a northeast-southwest direction, but no one particular lithology appears to have had significant control on the topography. The county lies almost entirely within the Piedmont physiographic province where the bedrock consists predominantly of metamorphic rocks of Paleozoic age. Consolidated sedimentary rocks of Early Triassic age occupy a down-faulted basin in the western part of the county. On hills and ridges along the county's eastern border, small erosional remnants of unconsolidated Cretaceous sedimentary rocks extend westward from the Coastal Plain in Prince George's County. (See Figure 2-F2.)

The bedrock in the eastern two-thirds of the county's Piedmont province consists of rocks of the Wissahickon Group. The best example of these rocks is exposed in the quarry of Rockville Crushed Stone Company in northern Travilah, where the serpentinite is quarried for use as crushed stone aggregate. Quarries for building stone from micaceous quartzite are located in several places of the western schist belt.

Fine-grained slaty rocks mapped as the Urbana (e.g., Harpers), Ijamsville, and Marburg phyllites occupy the county's Piedmont province west of a line running north-northeast from Blockhouse Point on the Potomac River to a point on the Patuxent River north of Etchison, at Annapolis Rock. A large area in the western corner of the county is underlain by consolidated sedimentary rocks of Triassic age, which represent a small portion

Figure 2-F1: Topography

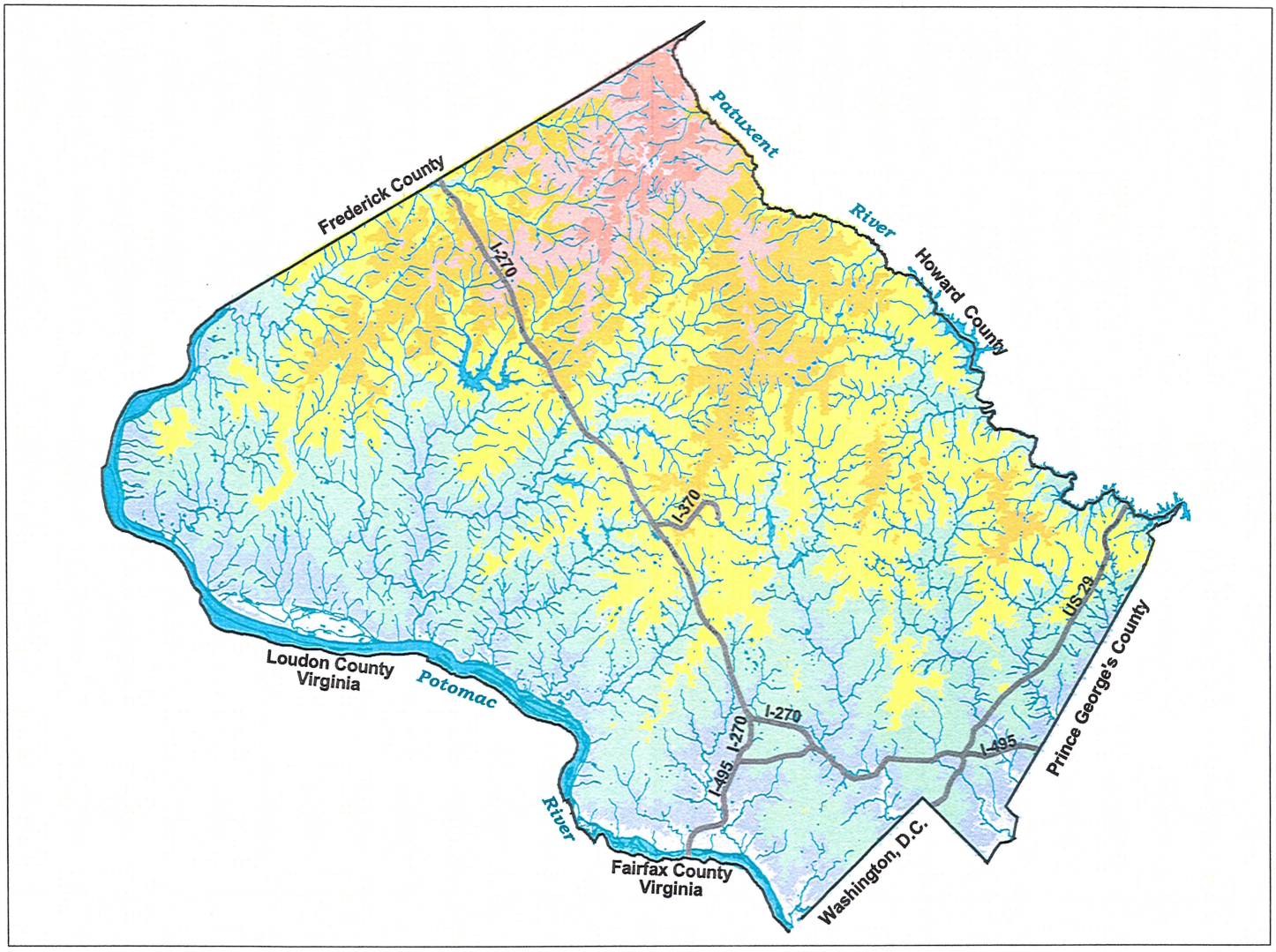
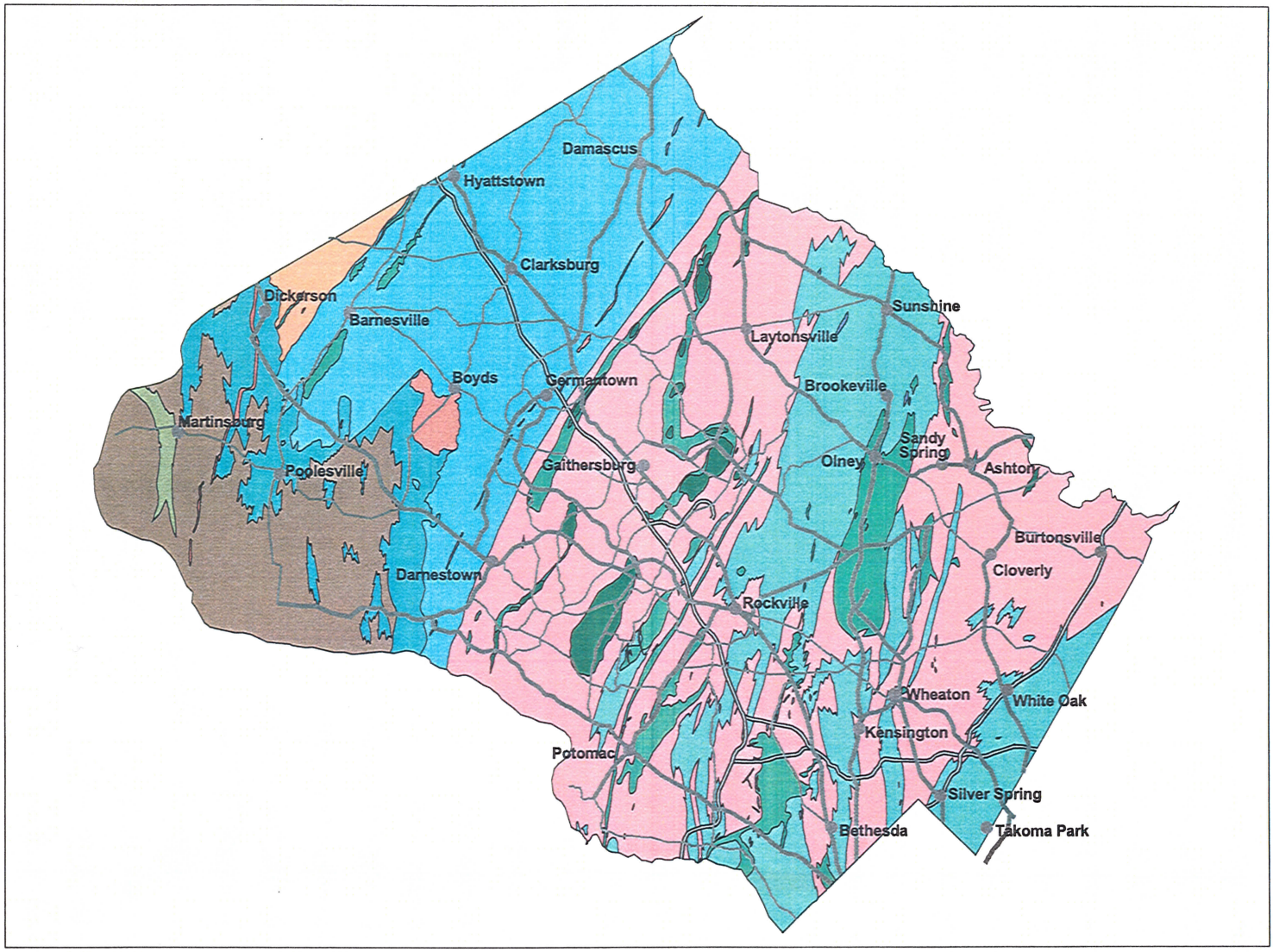


Figure 2-F2: Geologic Map



MAP LEGEND

Generalized Geology - Rock Types

- Diabase
- Gneiss
- Limestone Conglomerate
- Mafic Rocks
- Phyllite
- Quartz Bodies
- Quartzite
- Sandstone (Arkose)
- Schist
- Siltstone
- Ultramafic Rocks

- Localities

Major Roads

- County Roads
- State Roads and Highways
- US & Interstate Highways

Source: MC:MAPS

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of the large Culpeper Basin in neighboring Virginia. Red sandstone of Triassic age was quarried for building stone at several places along the bluffs north of the Potomac River during the 19th century.

Alluvial deposits consisting of gravel, sand, silt, and clay of recent age are present along the Potomac River, particularly in the wide bottomlands in the area of Triassic rocks west of Seneca. This alluvial fill is much less developed where the river channel has been cut into hard metamorphic rocks such as along the Potomac River east of Seneca, along the Patuxent River, and in the larger streams tributary to these rivers.

A large, high-level gravel terrace lies on Triassic age bedrock between Martinsburg and Elmer in the western part of the county. The Potomac River laid down these gravels as floodplain deposits when it flowed at a higher elevation in the late Tertiary or early Quarternary, before eroding down to its present channel. Smaller patches of this same material occur to the south along the bluffs overlooking the floodplain of the river.

D. Soils -- The soils of Montgomery County are mapped on Figure 2-F3 and can be summarized as follows under six general descriptions:

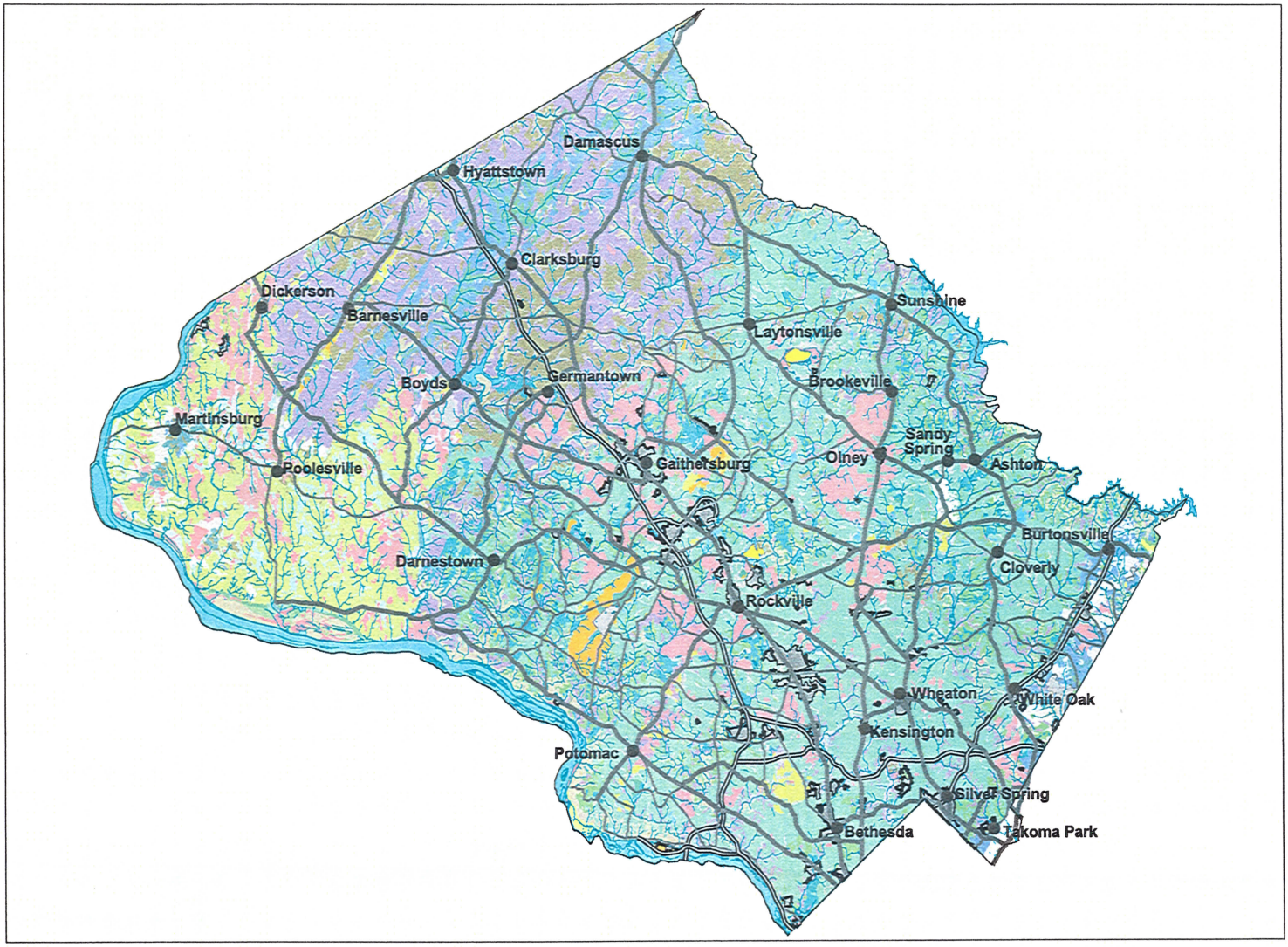
Table 2-T1: County Generalized Soils Descriptions

Soil Groups	Area*	Description
Glenelg-Gaila-Occoquan	41%	Nearly level to strong sloping, well drained, deep and very deep soils that are loamy throughout. This soil type is found in the central part of the county and extends to the east and south. It is found on broad ridge-tops and side slopes.
Brinklow-Baile-Occoquan	16%	Nearly level to moderately steep, well and poorly drained, moderately deep soils that are loamy throughout. This soil type is found in the northern part of the county. It is found on broad ridge-tops and side slopes.
Urban land-Wheaton-Glenelg	16%	Nearly level to strongly sloping, well drained, very deep soils that are loamy throughout. This soil type is found in primarily in the Germantown area and in southern and eastern portions of the county. It is found on broad ridge-tops and side slopes.
Penn-Brentsville-Readington	14%	Nearly level to steep, well and moderately well drained, moderately deep and deep soils that are loamy throughout. This soil type is found in the western part of the county. It is found on broad ridge-tops and side slopes.
Blocktown-Brinklow-Linganore	10%	Gently sloping to steep, well drained and moderately deep soils that are loamy throughout. This soil type is found in the northern part of the county. It is found on broad ridge-tops and side slopes.
Chillum-Croom-Beltsville	3%	Nearly level to steep, well drained and moderately well drained, very deep soils. This soil type is found in the eastern part of the county along the Prince George's County line. It is found on broad ridge-tops and side slopes.

* Percent area of the county.

E. Water Resources -- The county's water resources affect many aspects of its water supply and wastewater disposal needs. Surface water flows, influenced by the underlying geology, have created the county's hills and valleys, establishing its watersheds. The resulting topography strongly influences the structure and alignment of wastewater collection systems and the need for various water supply pressure zones. Surface water resources provide the majority of the county's community water supply. Surface waters also receive treated flows from several wastewater treatment plants. Groundwater, specifically its depth and availability, more strongly affects individual water and sewerage systems, municipal water systems dependent on wells (such as Poolesville), and also provides the base flow to surface streams.

Figure 2-F3: Soils Map



5 0 5 10 15 20 Miles

MAP LEGEND

Soil Types *

- BAILE
- BELTSVILLE
- BLOCKTOWN
- BOWMANSVILLE
- BRENTSVILLE
- BRINKLOW
- BUCKS
- CHILLUM
- CHROME
- CODORUS
- CONOWINGO
- CROOM
- CROTON
- DELANCO
- ELIOAK
- ELK
- ELSINBORO
- EVESBORO
- GAILA
- GAILA SILT LOAM
- GLENELG
- GLENVILLE
- HATBORO
- HUNTINGTON
- HYATTSTOWN
- JACKLAND
- LEGORE
- LINDSIDE
- LINGANORE
- MELVIN
- MONTALTO
- NESHAMINY
- NESTORIA
- OCCOQUAN
- PENN
- READINGTON
- ROCK OUTCROP
- ROWLAND
- SASSAFRAS
- TRAVILAH
- WHEATON
- WATCHUNG
- DUMPS, REFUSE
- PIT, GRAVEL
- PIT, QUARRY
- URBAN LAND

N W E S

- Communities

Major Roads
- County Roads
- State Roads and Highways
- US & Interstate Highways
- Ponds - Lakes - Reservoirs - Rivers
- Streams

* Source: "Soil Survey of Montgomery County, Maryland", USDA/MCSWCD via MC:MAPS

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1. Groundwater -- Figure 2-F4 shows the major hydrogeologic units in the county. Most of the groundwater in these units occurs in the soil and weathered surface mantle which has an average thickness of 20-50 feet. Other groundwater is found in cracks and pores of the underlying rock.

The soil mantle over the rock of the Manassas (New Oxford) formation is particularly thin, generally less than five feet. However, open spaces in this rock are estimated to comprise 5 or more percent by volume near the surface. Other rock formations generally have up to only about 1 percent by volume of pore spaces.

Groundwater obtained from rock formations derives primarily from cracks in the rock, called joints. Near the surface, these cracks may be open and subject to weathering and accumulations of rock fragments and clay. At greater depth, under the weight of the overlying rock, these cracks are forced together. At depths generally in excess of 200-300 feet the cracks tend to become tightly pressed together and provide little space for the penetration and movement of water.

The average annual depth of the groundwater table in Montgomery County varies considerably from place to place depending on the type of rock, and the topographic situation, as well as the annual rainfall. At an observation well at Fairland, in the Wissahickon schist of the eastern part of the county, average annual depth to groundwater is between 8 to 10 feet. The comparable depth at an observation well at Damascus in the Ijamsville phyllite, in a more rugged topography, is between 30-45 feet. In scattered wells in the Manassas (New Oxford) siltstones and sandstones, the water table lies at about 70-120 feet. However, this formation contains thin, saturated zones five to ten feet thick at lesser depths from which small quantities of water can be obtained. Water at significantly greater depths in the Manassas formation has been reported from a well adjacent to the Potomac River. In general, however, groundwater lies chiefly in a surface zone approximately 150 to 250 feet thick.

Faults–joints along which there has been significant movement or shearing–may serve as pathways for water movement, as do particularly large joints insofar as the collection of water is concerned. However, because of rock decomposition in the presence of water, both faults and joints tend fill with silt and clay whose water-bearing properties are similar to those of the surface materials. No open voids or joints, indicative of subsurface removal of these fine particles, have been observed in this county. It appears that the flow of groundwater in the county is generally too weak to accomplish this. It is estimated that groundwater, under natural conditions, moves laterally toward springs, seeps, ponds, or streams at a rate of approximately 10 to 100 feet per year.

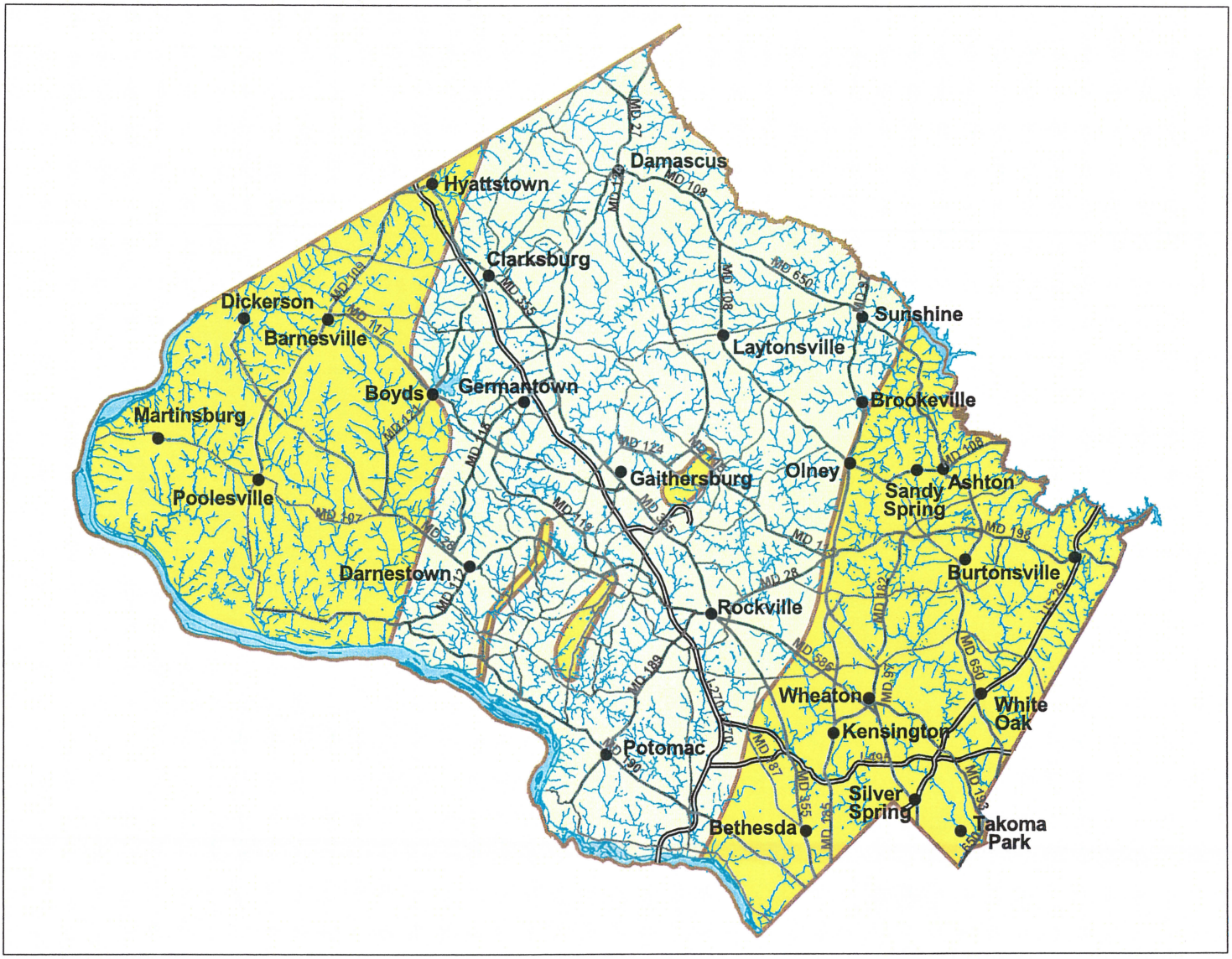
Wells in the county are unlikely to provide sufficient quantities of water for municipal supply. Only the Poolesville municipal water supply system depends on groundwater supply. Depending upon the host rock, groundwater well yields average from less than 1 gallon per minute to more than 25 gallons per minute. Under the County's regulations, permitted domestic wells must yield a minimum of 1 gallon per minute.

2. Surface Water and Watersheds -- The county's rivers, lakes, and streams provide drinking water, recreational opportunities, and vital habitat for aquatic and terrestrial wildlife. Surface water resources from the Potomac and Patuxent Rivers provide the majority of the county's community water supply. Surface waters also receive treated flows from the county's four publically-owned wastewater treatment plants:

- Magruder Branch from the Damascus WWTP
- Great Seneca Creek from the Seneca Creek WWTP
- Dry Seneca Creek from the Poolesville WWTP
- Little Bennett Creek from the Hyattstown WWTP

Surface water comes from groundwater, which provides the base flow in streams, and from run-off from rain and snow, which provide storm flows in excess of the base flow. All of the lakes in the county are man-made. The larger lakes were built for flood and sediment control and water supply. Some county

Figure 2-F4: Generalized Aquifer Map



5 0 5 10 15 20 Miles

MAP LEGEND

- Communities

Major Roads
- County Roads
- State Road and HIghways
- US & Interstate Highways
- Streams
- Lakes - Ponds - Rivers

County Aquifer Units

Unit II: The yields of wells in this unit range from less than 1 gallon per minute (gpm) to about 320 gpm. In this unit there is about a 6% chance of getting a yield of 50 or more gpm.

Unit III: The yields of wells in this unit range from less than 1 gpm to 200 gpm. In this unit there is only a 2% chance of getting a yield of 50 or more gpm.

N W E S

Source: "The Quantity and Natural Quality of Groundwater in Maryland," - MD Dept. of Natural REsources, 1982

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receive treated wastewater discharges. Ultimately, all waterways flow into the Chesapeake Bay. Montgomery County's major surface drainage patterns are illustrated in Figure 2-F5.

The county's surface water drainage pattern provides a template for the alignment of much of its community sewer transmission main network. Most sewer mains operate by gravity and generally follow the "low flow" path downhill towards treatment or pumping facilities. This, of necessity, often requires the construction of sewer mains in close proximity to the county's rivers and streams.

Surface waters flow within 27 major watersheds, which include 270 subwatersheds and 1500 miles of streams flowing into four major rivers: the Anacostia, the Monocacy, the Patuxent, and the Potomac. The Potomac River borders the county to the west and southwest, the Patuxent River borders the county to the northeast. Twelve percent (12%) of the county drains to the Anacostia River which, in turn, drains to the Potomac River in the District of Columbia. Ten percent (10%) of the county drains toward the Monocacy River which, in turn, drains to the Potomac River just upstream of the Montgomery-Frederick County border. Twelve percent (12%) of the county drains into the Patuxent River. The remaining sixty-six percent (66%) of the county drains directly into the Potomac River and its major tributaries. The county's watersheds and their associated drainage areas are listed on Table 2-T2.

Table 2-T2: County Watershed Drainage Areas

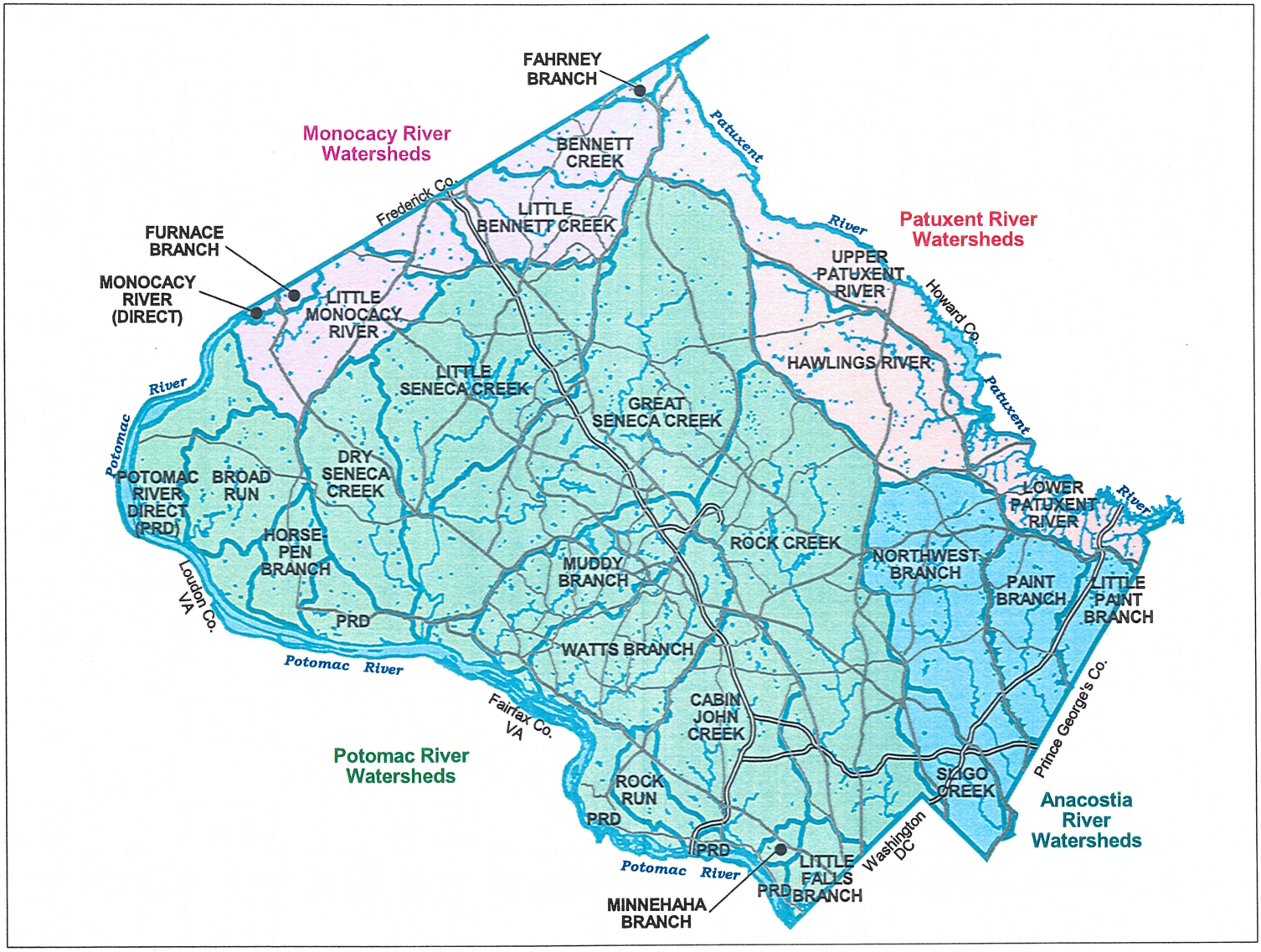
Watershed	**Area** (acres)	Watershed	**Area** (acres)
Anacostia River Watersheds	**38,062**	**Potomac River (Direct) Watersheds**	**206,231**
Little Paint Branch	3,496	Broad Run	9,227
Northwest Branch	19,603	Cabin John Creek	15,836
Paint Branch	9,453	Dry Seneca Creek	12,335
Sligo Creek	5,510	Great Seneca Creek	45,679
Monocacy River Watersheds	**31,903**	Horsepen Branch	6,733
Bennett Creek	6,179	Little Falls Branch	3,184
Fahrney Branch	829	Little Seneca Creek	25,145
Furnace Branch	493	Minehaha Branch	909
Little Bennett Creek (2 parts)	12,831	Muddy Branch	12,163
Little Monocacy River	11,571	Potomac River Direct	18,155
Monocacy River Direct	340	Rock Creek	39,363
Patuxent River Watersheds	**38,498**	Rock Run	3,211
Hawlings River	18,017	Watts Branch	14,291
Lower Patuxent River	7,226		
Upper Patuxent River	13,255	**Total County Watersheds**	**314,694**

Source: Countywide Stream Protection Strategy, Feb. 1998

3. Wetlands -- The important role of wetlands as natural filters in maintaining water quality is acknowledged at the federal, state, and local levels. It is recognized that loss of wetlands means decreased water quality protection, flood control, and wildlife habitat. Wetlands are vulnerable to off-site, indirect impacts such as hydrologic alterations and pollution.

Regulations regarding the definition of, and allowable impacts to, wetlands continue to evolve. Wetlands are defined by the Planning Board's guidelines of February 1997 for Environmental Management of Development in Montgomery County as "an area that is inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support, and that under normal circumstances does

Figure 2-F5: Major Watersheds



5 0 5 10 15 20 25 Miles

MAP LEGEND
- County Roads
- State Roads & Highways
- US & Interstate Highways
- Streams - Rivers
- Ponds - Lakes - Reservoirs
- Potomac River (Direct) Watersheds
- Anacostia River Watersheds
- Patuxent River Watersheds
- Monocacy River Watersheds

N W E S

Source: DEP Watershed Management Div.

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support, a prevalence of vegetation typically adapted for life in saturated soil conditions, commonly known as hydrophytic vegetation."

Information on the location of major wetland areas in the county is available through National Fish and Wildlife Service maps. The County's Department of Park and Planning requires more accurate delineations of wetlands by a developer's engineer during the development review process. This detailed delineation is also required by federal and state agencies as a part of their wetland permit review processes.

Several levels of government regulate the impacts of development and construction activities on wetlands. The intent of the various county, state, and federal regulations and guidelines is to first, avoid impacts; secondly, minimize and mitigate impacts; and thirdly, replace wetlands lost through development. The creation of functional and sustainable replacement wetlands is both land intensive and expensive.

MDE has identified twelve areas in the county as being non-tidal wetlands of special state concern. These areas include the Germantown Bog, Canal Bottomland, and McKee-Beshers West Swamp. The State designates these wetlands for special protection under its non-tidal wetlands regulations because they exemplify Maryland's best non-tidal wetland habitats. Excavation, filling, or other modification within a buffer of 100 feet from these wetland areas needs state permits. In contrast, disturbance within 25 feet of other non-tidal wetlands requires state permits. Both cases require water quality certification by the MDE as required by the Clean Water Act. The county's wetland areas are shown in Figure 2-F6, Non-Tidal Wetlands.

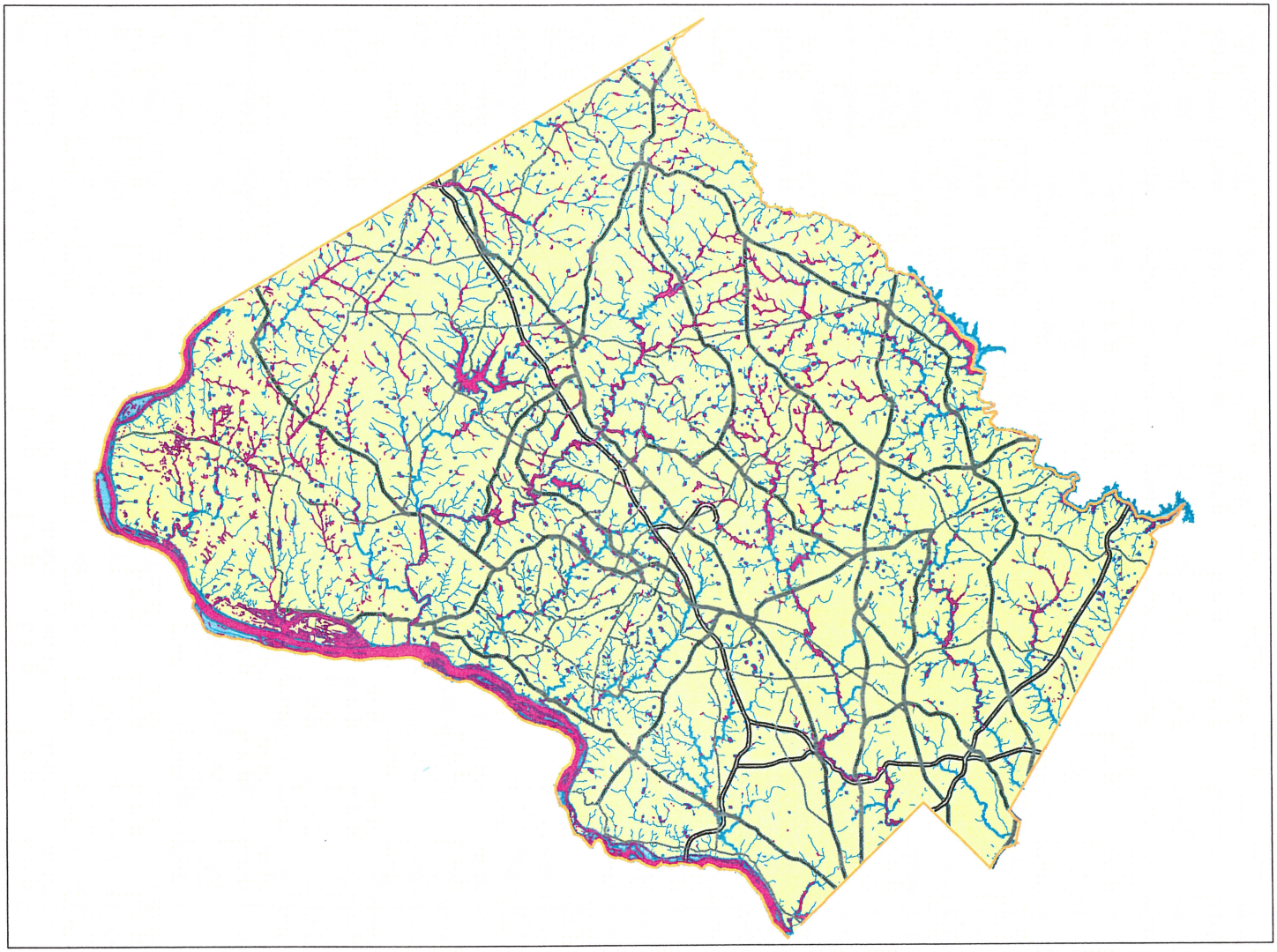
4. Water Quality Conditions -- MDE water quality standards place the surface waters of the State into water use designations with specific water quality criteria. The county's waters are covered under use designations listed below in Table 2-T3 and mapped on Figure 2-F7.

Table 2-T3: State Watershed Use Designations

Designation	Definition
Use III	**Natural trout waters.** Waters which are suitable for the growth and propagation of trout, and which are capable of supporting self-sustaining trout populations and their associated food organisms.
Use III-P	**Natural trout waters and public water supply.** Waters which include all uses identified for Use III waters and are used as a public water supply.
Use IV	**Recreational trout waters.** Waters which are capable of holding or supporting adult trout for put and take fishing, and which are managed as a special fishery by periodic stocking and seasonal catching (cold or warm waters).
Use IV-P	**Recreational trout waters and public water supply.** Waters which include all uses identified for Use IV waters and are used as a public water supply.
Use I	**Water contact recreation and protection of aquatic life.** Waters which are suitable for: water contact sports, play and leisure time activities where the human body may come in direct contact with the surface water; fishing; the growth and propagation of fish (other than trout); other aquatic life, and wildlife; agricultural water supply; and industrial water supply.
Use I-P	**Water contact recreation, protection of aquatic life and public water supply.** Waters which are suited for all uses identified in Use I and are used as a public water supply.
Use II	**Shellfish harvesting waters.** Waters where shellfish are propagated, stored or gathered for marketing purposes; and where there are actual or potential areas for the harvesting of oysters, softshell clams, hardshell clams, and brackish water clams. (*Note: There are no Use II waters within Montgomery County.*)

5. Water Quality Programs -- In 1994, DEP reestablished a monitoring presence on county streams, focusing on measurement of biological communities (fish, macro invertebrates), habitat indicators, stream base flows, and conductivity as well as on the previous dissolved oxygen, pH, temperature criteria in

Figure 2-F6: Non-Tidal Wetlands



5 0 5 10 15 20 25 Miles

MAP LEGEND
- Wetlands*

Major Roads
- County Roads
- State Roads and Highways
- US & Interstate Highways
- Streams - Rivers
- Ponds - Lakes
- Montgomery County

* Note: All Montgomery County welands are non-tidal.

N W E S

Source: MC:MAPS

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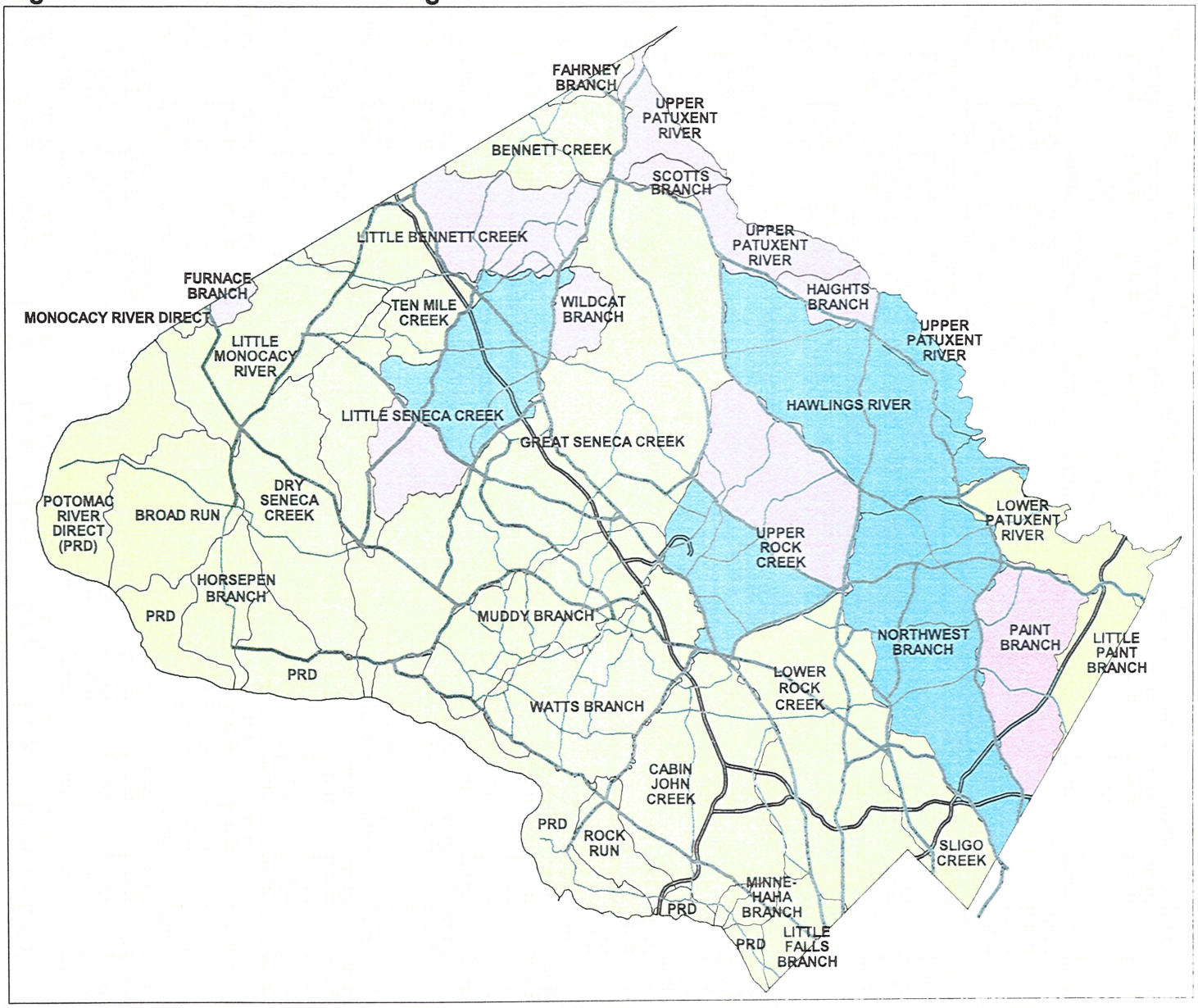
Figure 2-F7: State Water Use Designations



State water quality standards. The biological and habitat indicators are used to determine overall stream health and to assess whether physical runoff impacts (excessive peak flows and velocities, stream erosion, sedimentation) or chemical pollutants are the primary cause of observed stream degradation. DEP has also measured baseline stream conditions in the County's least disturbed and highest quality watersheds and uses these reference indicators as a benchmark to assess relative stream health in the other county streams.

DEP and M-NCPPC cooperatively developed a *County-wide Stream Protection Strategy* (CSPS, February 1998) to rank the overall biological health of each county watershed, and assess the potential for improving conditions in degraded streams. This potential will be determined based upon the degree of existing or planned watershed development and the estimated effectiveness of practical and appropriate management tools available for mitigation. The County's current ratings of stream conditions, based on biological monitoring, are shown in Figure 2-F8. Results from the CSPS are being used to help the County set priorities for resource allocations for future watershed protection initiatives. The County plans to update the CSPS every 3-5 years thereafter as new trends and monitoring data become available. DEP provides information from the CSPS on its website at www.askdep.com.

Since the mid-1980's, the County has gradually and substantially improved the effectiveness of controls to mitigate the impacts of runoff and sediment from new development activity. In the late 1980's, the County also began to implement programs to restore habitat in streams impacted by serious stream erosion, sedimentation, and localized flooding problems. This work is focused to mitigate impacts in watersheds caused largely by uncontrolled runoff from development which occurred before stormwater and sediment controls were legally required. However, much more work remains to be done and only limited resources are available to rectify these types of problems, particularly in watersheds containing the county's older developed areas. These efforts are particularly important in areas of the county where erosion and down-cutting of the stream beds has resulted in exposure of sewer lines, water lines and impacts to road crossings and other infrastructure that are costly to address, yet result in further impairment to the stream system if not addressed.

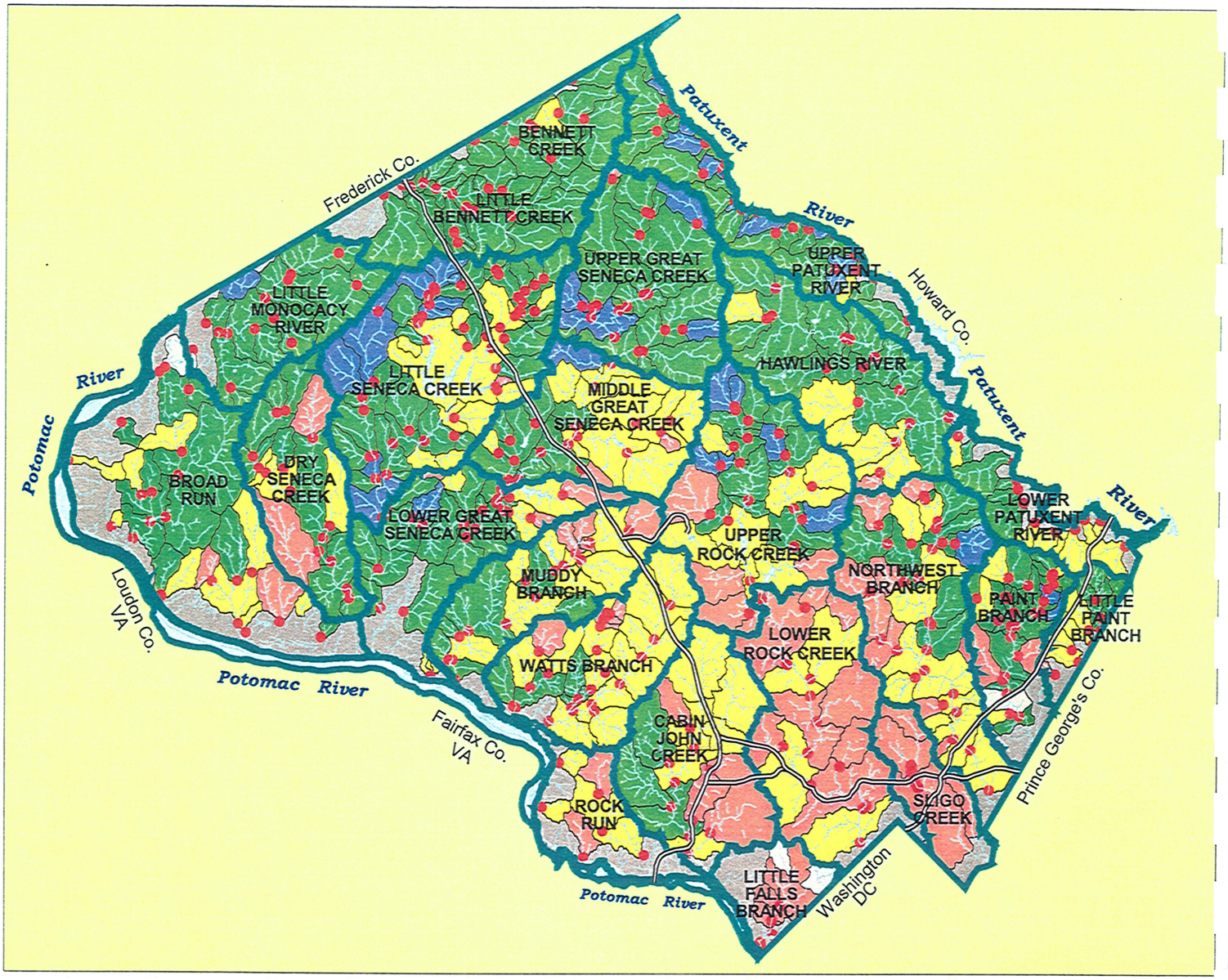
The County has also long recognized the need to protect its groundwater resources. Approximately 80,000 county residents rely on groundwater as their only source of water supply. In 2001, the County began to develop a program intended to address its groundwater protection needs. The November 2001 *Groundwater Protection Strategy* (GWPS) represents the first major step in achieving this goal. The GWPS emphasizes a need to establish a baseline existing condition of the county's groundwater resources, and to establish a long-term groundwater monitoring program. The GWPS also recognizes the need to establish appropriate policies, guidelines, and regulations to minimize future contamination, and then to ensure that future development will comply with environmental laws and regulations affecting groundwater quality. In the first steps of this strategy, DEP has conducted a limited survey of available well and septic permit records, noting the location of each. The well permits also provided information on the depth to the water table throughout much of the county. DEP is instituting a county-wide network of fifty sampling wells to establish a baseline groundwater condition and to serve as future monitoring sites.

In 2002, the County implemented a Water Quality Protection Charge through County tax bills to provide funding for a comprehensive Stormwater Facility Maintenance Program to pay for structural maintenance of residential and associated nonresidential stormwater facilities. The program itself will ensure the ongoing inspection and maintenance of stormwater management facilities within the County. These stormwater facilities, which include wet ponds, dry ponds, sand filters, infiltration trenches, oil and grit separators, and underground storage structures, play a vital role in the protection of the county's streams, water supplies, and personal safety. Inspection and maintenance of stormwater infrastructure is essential to keep these valuable components functioning properly, allowing them effectively to remove pollution, recharge groundwater, protect stream banks, and protect roads and properties from flooding. The water quality protection charge will help provide funds for maintenance of stormwater facilities owned by the County.

a. County Water Quality Goals -- In November 1994, Montgomery County adopted water quality goals as follows (Montgomery County Code, Chapter 19, Article IV):

- Protect, maintain, and restore high quality chemical, physical, and biological conditions in the waters of the state in the County;

Figure 2-F8: CSPS Stream Ratings



Source: DEP Watershed Management Div.
2003 CSPS Update

Watershed Management Division
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- Reverse the past trends of stream deterioration through improved water management practices;

- Maintain physical, chemical, biological, and stream habitat conditions in County streams that support aquatic life along with appropriate recreational, water supply, and other water uses.

- Restore county streams, damaged by inadequate water management practices of the past, by reestablishing the flow regime, chemistry, physical conditions, and biological diversity of natural stream systems as closely as possible.

- Help fulfill interjurisdictional commitments to restore and maintain the integrity of the Anacostia River, the Potomac River, the Patuxent River, and the Chesapeake Bay.

- Promote and support educational and volunteer initiatives that enhance public awareness and increase direct participation in stream stewardship and the reduction of water pollution.

These goals are applied to guide the planning and implementation of the County's water resources protection programs as described below.

b. Water Resources Management Programs -- A number of local agencies administer coordinated programs to manage and protect county water resources. These programs help protect streams, water quality, and aquatic life by regulating and mitigating the impacts of land use change as it occurs in County watersheds. For example, requirements for stormwater management applied at the time of new land development involve a variety of active and passive techniques to reduce the amount of surface runoff, sediment and pollutants generated and introduced into the stream system. These measures are designed to maximize runoff infiltration into the soil profile and reduce peak runoff flows delivered to streams. They also help maintain stream base flows, limit erosion and other damage to stream habitat and aquatic resources, and complement localized flood protection. Some programs regulate wells and septic systems to protect groundwater water quality. Others apply a variety of monitoring, inspection, enforcement, maintenance, and educational programs to track water quality and limit pollution discharges.

c. State Programs -- MDE provides general oversight to water and sewerage system planning stormwater, sediment control, and NPDES stormwater permit and related facility implementation programs administered by DPS, DEP, WSSC, and M-NCPPC. Treated wastewater discharges and industrial stormwater runoff discharges to County streams are permitted directly by MDE as part of the NPDES municipal discharge permit program.

Disturbances to wetlands require permits from the U.S. Army Corps of Engineers, MDE, and the Maryland Department of Natural Resources. Stream channel alternations, surface and groundwater appropriations are also regulated directly by MDE and the Maryland Department of Natural Resources.

d. Chesapeake Bay Protection -- Maryland, Virginia, Pennsylvania, Washington, D.C., the U.S. Environmental Protection Agency, and the Chesapeake Bay Commission signed the 1987 Chesapeake Bay Agreement to provide comprehensive guidance for minimizing the negative impacts of land activities in the Chesapeake Bay drainage area. The Agreement provides specific goals for improving the Bay such as a 40 percent reduction in nutrient pollution by the year 2000.

Montgomery County is a member of the Mid-Potomac Tributary Team and Patuxent River Commission which Maryland established to develop the agency/citizen/business partnerships necessary to meet this target in these Bay tributaries. Additional information on the principal programs which help manage the county's water resources are included in Chapter 1, Section I.D.

III. CULTURAL ENVIRONMENT

This section presents data on projected growth and densities required for planning the public facilities addressed by this Plan. For example, the projected population of the county is a major determinant of future water supply demands and wastewater flows. Projected changes in land use from rural categories to suburban and urban uses direct where community water and sewerage systems will be needed in the future. The changes can result in impervious areas, increasing peak stormwater runoff flows that affect streams and create stormwater management needs.

A. Legal Requirements and Other Policy Guidance -- Legal and policy guidance and requirements for water supply, sewerage, stormwater management, and rural sanitation planning are provided by Federal, State, and County governments and by regional agreements. The County government's major relevant policy vehicles are outlined below. The staging mechanisms of these policy and regulatory tools provide for managing the timing and extent of growth in the county. As an important element in growth management and staging, the Comprehensive Water Supply and Sewerage Systems Plan accounts for the land use plans and staging policies of individual areas of the county, for the current status of development in each area, and for the future expectations of population, employment, and housing trends. In this way, the Water and Sewer Plan can project the county's future water supply and sewerage systems needs and coordinate those needs with development in the county.

1. General Plan -- Montgomery County's comprehensive land use plan, the General Plan, was adopted in 1964 and most recently refined in 1993. The General Plan provides a comprehensive framework for guiding physical development and managing limited resources in the county. It identifies the general location, function, intensity, and pattern of various land uses; provides direction for integrating future development and redevelopment with existing development; addresses the relationship between human activity and the built and natural environment; addresses the varying needs and desires of a diverse and changing county population and economic community; and promotes connections among all areas of the county and between the county and the region.

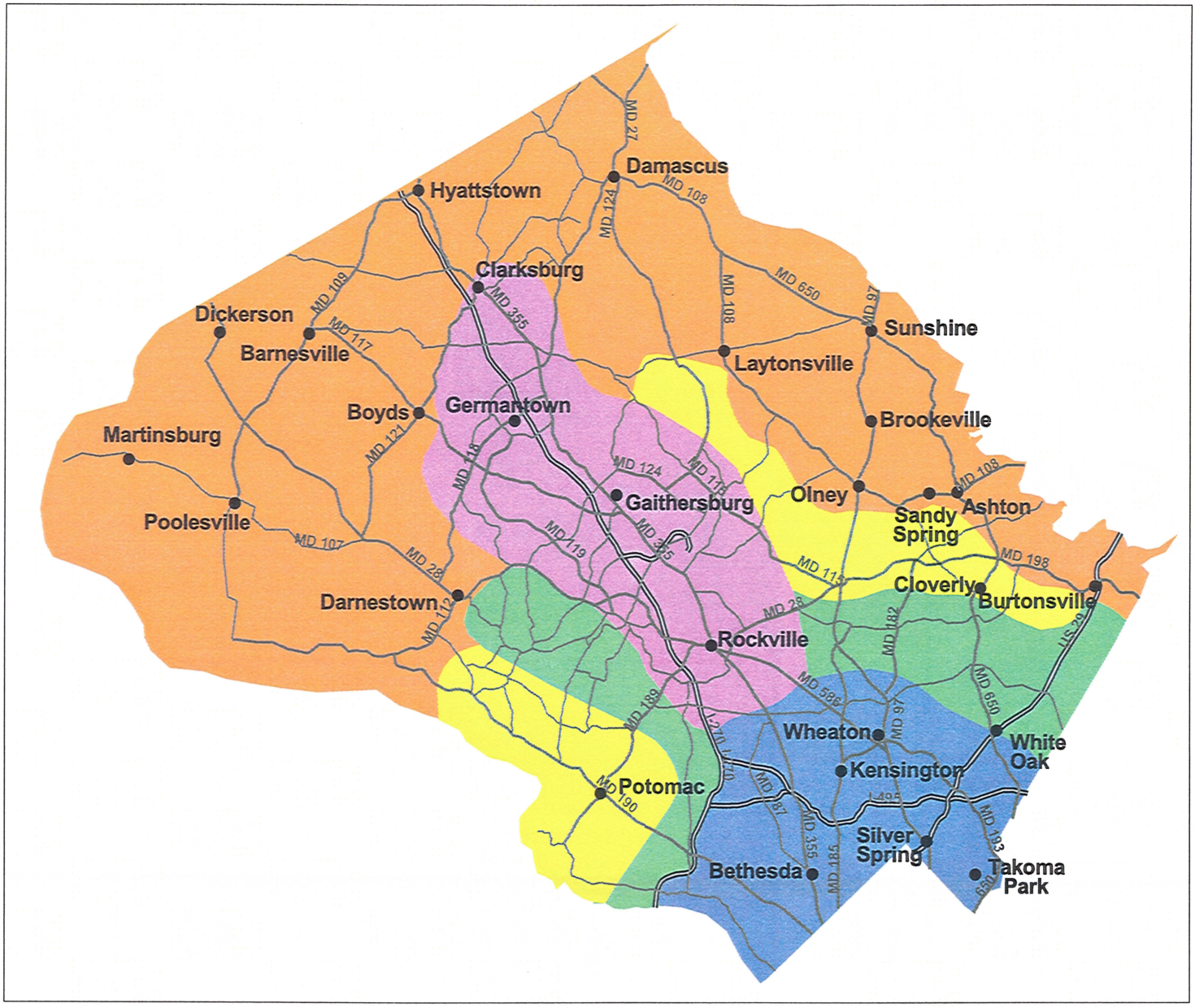
The General Plan is an evolving and dynamic policy document containing generalized concepts that provide the basis for more specific area master plans, functional plans, and sector plans. Each master plan, sector plan, and functional plan, after approval by the County Council and adoption by the M-NCPPC, constitutes an amendment to the General Plan. Master plans can provide specific water and sewer policies which are then implemented by the Comprehensive Water Supply and Sewerage Systems Plan. As the county's longest-range and most visionary document, the General Plan provides a broad image for the county's evolution and establishes a frame of reference to make that vision become a reality. It is specific enough to provide clear guidance for realizing its vision, while retaining enough flexibility to respond to unforeseeable circumstances as they arise.

The General Plan establishes a basic policy of concentrating development in a ring around the District of Columbia, and along major transportation corridors extending outward from this ring. The corridors are separated from each other by rural or low density wedges. The initial 1964 General Plan developed this Wedges and Corridors Concept, which the County reaffirmed in a 1969 update and refined in1993. This concept is viewed as the means to avoid sprawl, and, instead, to achieve an efficient, orderly, and attractive pattern of development.

The 1993 General Plan Refinement divides the county into four geographic components: the Urban Ring, the Corridors, the Suburban Communities, and the Wedge. With the exception of the Wedge, the borders between these areas are gentle transitions, not stark interruptions of an otherwise continuous pattern. Each area is defined in terms of appropriate land uses, scale, intensity, and function. The geographic components are illustrated in Figure 2-F9: Wedges and Corridors, Geographic Components.

An objective of the Comprehensive Water Supply and Sewerage Systems Plan is to plan for community service to implement and reinforce the Wedges and Corridors Concept. Wedge preservation policies are complemented by the limitation of community water and sewer service, except as may be necessary to resolve public health problems and permit limited expansion of existing settlements.

Figure 2-F9: Wedges & Corridors Geographic Componnents



MAP LEGEND

- Localities

Major Roads
- County Roads
- State Road and HIghways
- US & Interstate Highways

Geographic Components
- Agricultural Wedge
- I-270 Corridor
- Residential Wedge
- Suburban Communities
- Urban Ring

Montgomery County, Maryland
2002 - 2011
Comprehensive Water Supply
and Sewerage Systems Plan

Watershed Management Division
4/2/03-- GIS Project File: o:\wwteam\cwsp\2002update\chapt2\2-F9=wedgescorr.apr

The Wedges and Corridors concept reinforces and coordinates closely with Maryland's Smart Growth program. Under the Smart Growth Priority Funding Areas Act of 1997, the program's purpose is to limit sprawl development by directing State funding to areas where local governments want State investment to support future growth: higher-density development areas, redevelopment areas, and municipalities identified as Priority Funding areas. The legislation covers growth-related projects under most State programs that encourage or support growth and development. These can include highways, water and sewer construction, economic development assistance, and State leases or construction of new office facilities. In practice, State funding for water and sewer infrastructure in Montgomery County is primarily focused on improvements to water filtration and wastewater treatment plants. In following the guidance of the General Plan and its accompanying local area master and sector plans, this Water and Sewer Plan supports the Smart Growth program. The county's designated State Smart Growth/Priority Funding areas are shown in Figure 2-F10.

2. Staging Plans and Policies -- Guidance for the staging of development is contained in the General Plan, in the Annual Comprehensive Planning Policies Report, in various master plans, and in policies developed to guide the administration of the Adequate Public Facilities Ordinance.

3. Adequate Public Facilities Ordinance -- The Adequate Public Facilities Ordinance (an adjunct to the Subdivision Ordinance) places conditions on the County Planning Board's subdivision or recordation of land based on the availability of existing and programmed public facilities, such as transportation systems, water and sewerage systems, schools, police, fire and health facilities.

4. Capital Improvements Program -- The Capital Improvements Program (CIP) is the document through which the County government decides the extent and timing of the provision of its public facilities. This is a six year planning document that identifies the extent, timing, and funding of approved capital projects. The water supply and sewerage systems capital planning originates at WSSC with coordination with County agencies. This WSSC CIP is reviewed and approved jointly by the Prince George's County Council and the Montgomery County Council. Appendix A provides a listing and brief description of currently approved capital water supply and sewerage systems projects throughout the county.

B. Land Use -- The amount of land in the county is fixed; how it is used is not. The land area of the County is approximately 505 square miles, or about 323,000 acres. Residential development is the most common land use, accounting for about 60 percent of the developed land in 1995, with approximately 93,000 acres of land in residential use. The next most common developed uses were park and recreation uses with about 24,000 acres. Other community facilities, government and other open space accounted for about 23,000 acres. Office, commercial, retail, and industrial uses have consumed about 8,400 acres while transportation and utility rights-of-way accounted for about 6,000 acres in the developed areas.

Between 1960 and 1995, the amount of developed land in the county more than tripled from approximately 49,000 to about 160,000 acres. Developed land includes residential, community facilities, parks and recreation, commercial and industrial, as well as other uses such as rights-of-way for transportation and utilities.

The pattern of residential growth in the county has basically followed the Wedges and Corridors Concept since the adoption of the General Plan. The attached map represents the geographic distribution of households in 2000 as shown in Figure 2-F11. Approximately 97% of the population in Montgomery County is served by community water and approximately 93% of the population in Montgomery County is served by community sewer.

Figure 2-F11 illustrates that growth has occurred predominantly in the I-270 Corridor, the Urban/Suburban Ring, and the Satellite Communities, especially Olney. Growth in Residential Wedge areas has been substantial and is generally consistent with the land use recommendations expressed in the General Plan and subsequent area master plans. Table 2-T4 shows total population, household, and employment forecasts for the county in five-year intervals from 1990 through 2025. The County is divided into 28 planning areas. The planning areas are shown in Figure 2-F12. Continuing past trends, the I-270 Corridor is expected to lead all other planning areas in household population growth over the 2000 to 2025 forecast period, both in the rate of growth (39.1 percent) and in actual household population (74,200). Other leaders in percentage household

Figure 2-F10: Smart Growth Areas

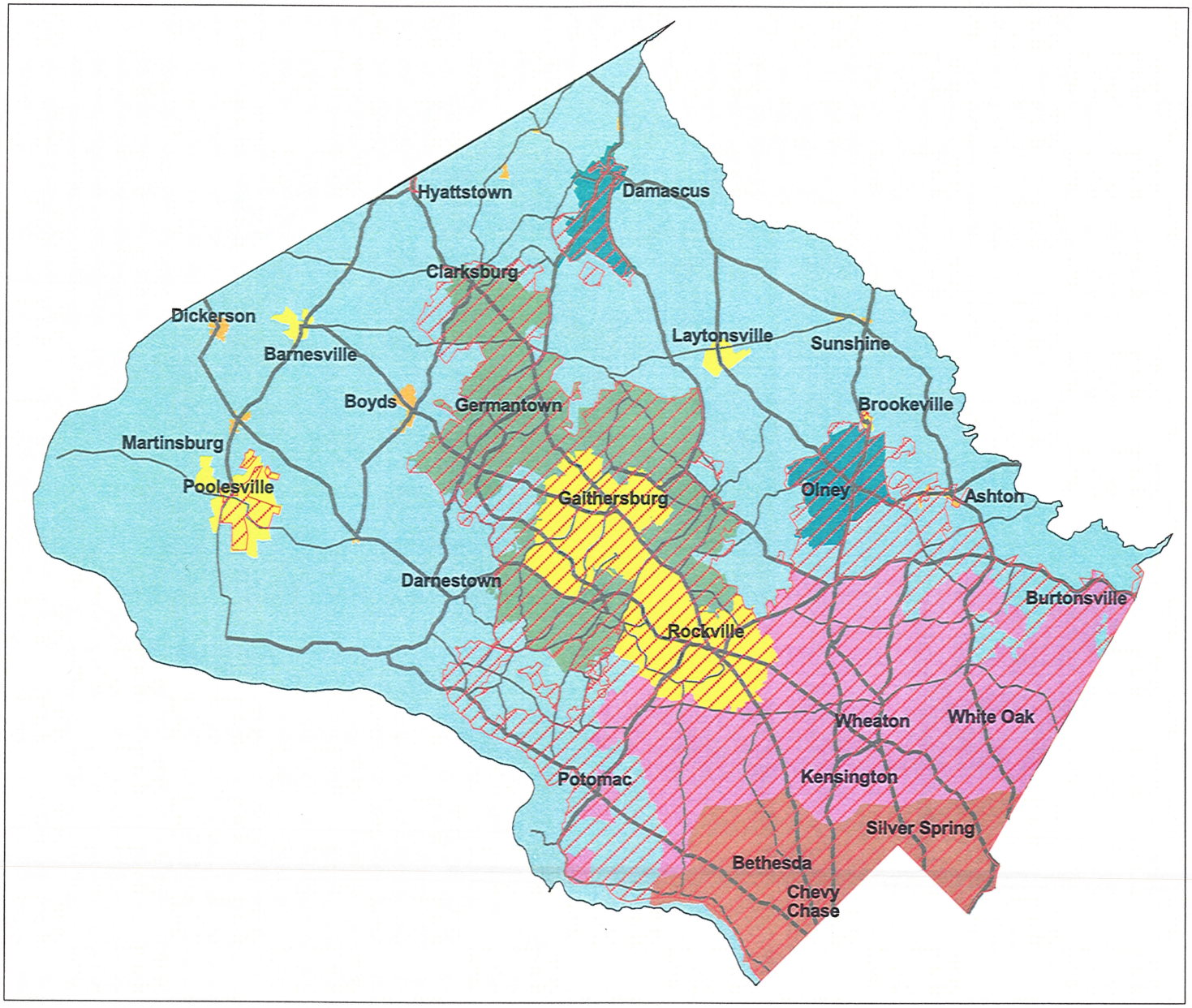


Figure 2-F11: 2000 Household Distribution

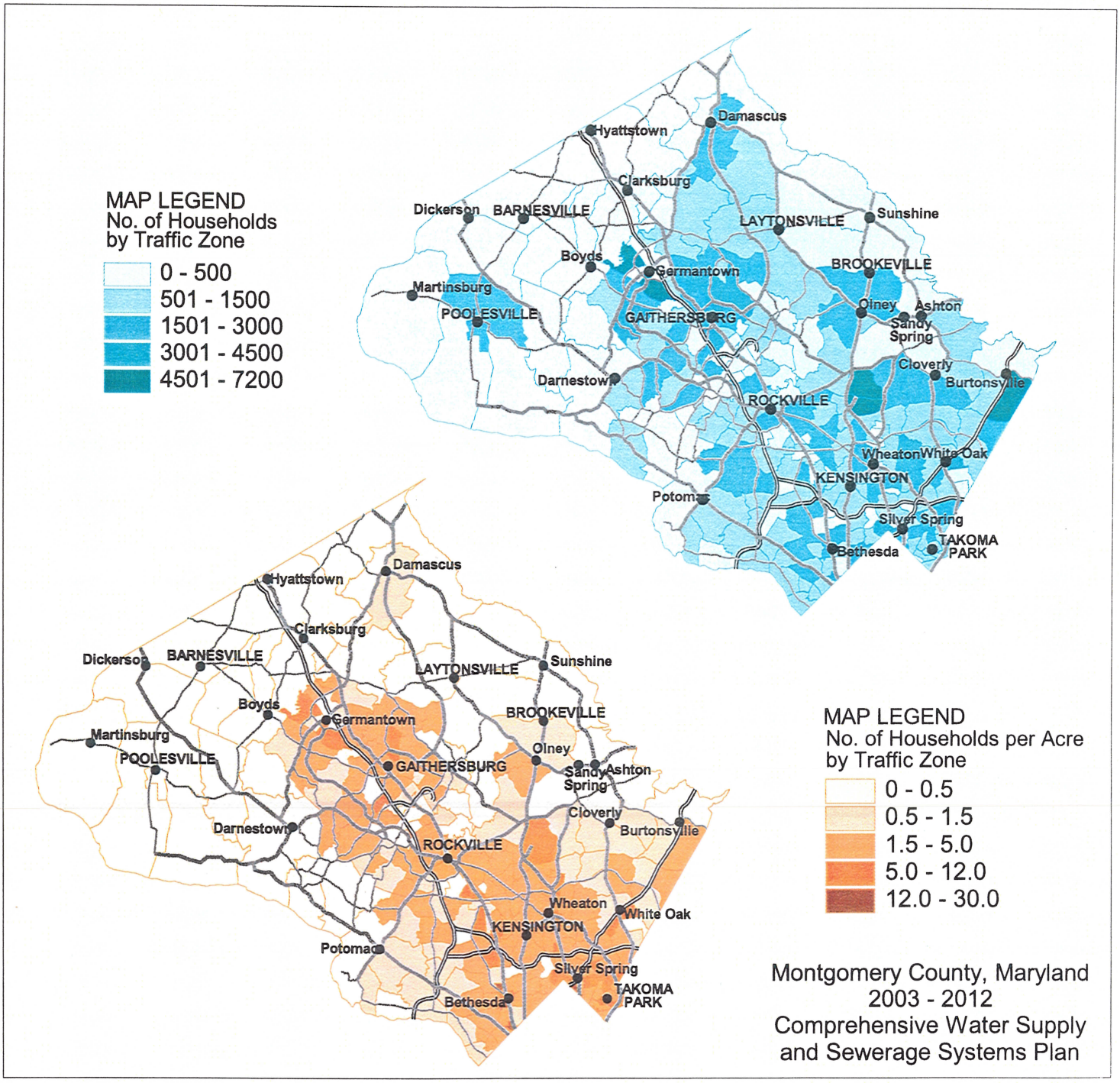
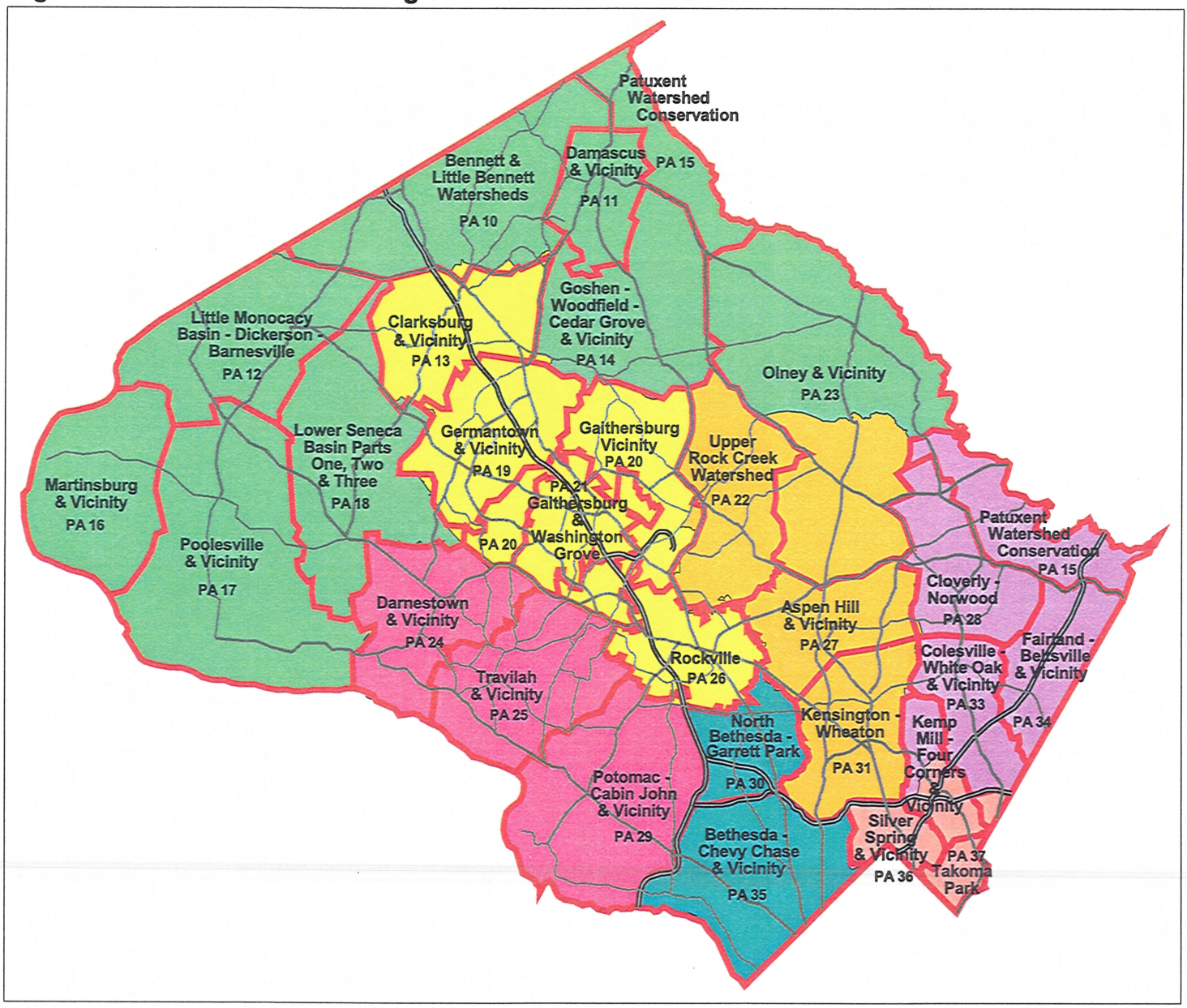


Figure 2-F12: M-NCPPC Planning Areas



5 0 5 10 15 20 Miles

MAP LEGEND

Major Roads
- County Roads
- State Roads & Highways
- US & Interstate Highways
- M-NCPPC Planning Areas

M-NCPPC Community-Based Planning Areas
- Bethesda Chevy Chase/North Bethesda
- Eastern County
- Georgia Avenue
- I-270 Corridor
- Potomac
- Rural
- Silver Spring/Takoma Park

N W E S

Montgomery County, Maryland
2003 - 2012
Comprehensive Water Supply and Sewerage Systems Plan

Watershed Management Division
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growth over this period are expected to be Damascus (21.5 percent/9,300 population), North Bethesda (23.2 percent/20,200 population), and Potomac (21.8 percent/17,400 population). Most of this population growth will occur in areas with sanitary service from existing or proposed community water and sewerage systems. Appendix C provides more detailed information on these forecasts, assembled by planning area.

Table 2-T4: County-Wide Population, Household and Employment Forecasts

	1990	1995	2000	2005	2010	2015	2020	2025
Total Population [A]	749,000	801,500	855,000	910,000	945,000	975,000	1,000,000	1,020,000
No. of Households [A]	280,000	299,000	317,500	336,500	356,500	376,500	392,000	402,000
Total Employment [B]	465,970	462,490	545,000	595,000	630,000	660,000	675,000	685,000

[A] "Total Population" includes all residential population from households and institutions (group quarters).
1990-1995: Round 6.1 Forecast (M-NCPPC, Research and Technology Center, & MWCOG – May 1999)
2000-2025: Round 6.2 Forecast (M-NCPPC, Research and Technology Center, & MWCOG – June 2000)

[B] "Total Employment" includes all office, retail, industrial, and other jobs.
1990-2025: Round 6.3 Forecast (M-NCPPC, Research and Technology Center, & MWCOG – February 2002)

The distribution of employment locations in the county has followed the Wedges and Corridor pattern of the General Plan, as illustrated in Figure 2-F13. The darkest patterns indicate the highest concentration of jobs. Traffic zones with more than 5,000 jobs are generally located in the Urban/Suburban Ring and in the I-270 Corridor. In the Ring, the highest concentrations are in the four central business districts, the City of Rockville, and the Rock Spring and West Farm office/industrial park areas. Employment is generally intense throughout the I-270 Corridor and centered along I-270 for the most part, with the Airpark to the northeast the most distant intensive location. In addition, the larger town and the satellite communities of Olney and Damascus have significant numbers of jobs, generally providing goods and services to local residents.

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Figure 2-F13: 2000 Employment Distribution